METRA
Energie-Messtechnik
Mitglied der Bopp & Reuther Messtechnik Gruppe

Energy and Flow Computer ERW 700

User Manual

METRA Energie-Messtechnik GmbH
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1 Identification

Manufacturer: METRA Energie-Messtechnik GmbH
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Type of product: Energy and flow computer

Product name: autarkon ERW 700

Version no.: ERW700; Hardware: HV3; Software: V1.32 and higher

2 Area of Application

2.1 Intended use

ERW 700 is designed to measure energy and flow rates for gaseous, vaporous and liquid media. Various types of volume, mass, flow, pressure, temperature and density sensors can be connected. The measured values and the set parameters are used according to generally acknowledged rules of technology to form the media data. In order to further process the measured and calculated values, it is possible to transfer the data via variably configurable standard interfaces.

2.2 Warning signs

At the time of delivery the energy and flow computer ERW 700 meets the highest technical specifications and is generally safe to operate. It has been tested and left the factory in perfect working order.
However, careless or incorrect usage of the energy and flow computer can result in hazardous situations.

Therefore, always observe the warning signs.

2.3 Operational safety

ERW 700 must not be used in explosive areas.

The energy and flow computer ERW 700 meets the following safety criteria:

- Safety requirements in accordance with EN 61010-1:2001
- Interference stability in accordance with EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-8
- Interference emit in accordance with EN 61326 Class A
- Heat meters in accordance with EN 1434-4 Class C
- Degree of protection provided by the enclosure IP 65 in accordance with EN 60529

Parameterization data is saved in the EEPROM during a power failure.

2.4 Personnel for installation, start-up and operation

- Only trained personnel who have received authorization from the system owner are allowed to carry out assembly, electrical installation, start-up, maintenance, and operation. They should have read and understood the operating instructions and always follow the information contained therein. Incorrect installation and start-up can result in significant measuring errors or damage to the device.
- Always adhere to national regulations.
- Danger of death if the power supply is connected incorrectly.

2.5 Factory setting

The energy and flow computer ERW 700 is supplied with a standard configuration or set to the operating conditions specified in the order.

Refer to the enclosed configuration data sheet for the set values.

Incorrect changes to the parameters can result in measuring errors.

2.6 Technical modifications

In view of technical developments, METRA Energie-Messtechnik GmbH reserves the right to make appropriate technical modifications without prior notice.

3 System Design

The energy and flow computer ERW 700 is a state-of-the-art calculation unit. ERW 700 has a graphical display which allows users to view all the relevant measuring and calculation values. Using the menu guidance, it is possible to alter the configuration and parameters via the respective keys. Optional input and output cards are available to enhance device functioning.

The energy and flow computer consists of the following components:

- Calculation unit with integrated inputs and outputs (basic module)
- LC display unit with 4 keys
- Input cards (optional)
- Output cards (optional)

4 Input

4.1 Measured data

Electrical measured data:
Current, pulse, frequency, resistance, contact (status)
Physical measured data:
Temperature, pressure, differential pressure, volume (flow), mass (flow), density

Special feature:
2 independent 24 Bit AD converters for resistance (temperature) and current.

Measured data	**Input parameter**
Resistance	Model: PT 100, PT500, PT1000 4-wire measurement Measuring ranges: -100 °C ... 600 °C PT100: -100 °C ... 600 °C PT500: -100 °C ... 500 °C PT1000: -100 °C ... 300 °C Overload protection: ± 24 V Measuring uncertainty T: 0.1 % of MV ± 0.1 K Measuring uncertainty ΔT: 0.1 % of MV ± 0.02 K Temperature influence T: 0.0025 % / K Temperature influence ΔT: 0.0010 % / K Resolution: 24 Bit Measuring rate: approx. 16 / s Sensor break monitoring Sensor current PT100: ca. 1.8 mA Sensor current PT500 / 1000: ca. 0.7 mA
Current	Measuring range: 0 ... 0.22 mA Overload protection: ± 24 V Error detection 3.6 mA according to Namur NE43 Measuring uncertainty: 0.01 % of MV ± 0.001 mA Temperature influence: 0.0025 % / K Resolution: 24 Bit Measuring rate: approx. 16 / s
Frequency Pulse Status	Frequency measurement: 0.1 Hz ...15 kHz Counting: 0 ... 15 kHz Min. measuring time can be set: (0.1 s, 1 s, 2 s) Measuring uncertainty: 0.01 % of MV Temperature influence: 0.0025 % / K Resolution: 0.001 % of MV

	Switchable hardware filter: Without, 50 Hz (for suppressing contact bounces) Signals active: Voltage Lo (U_S ca. 1,9/2,2 V) Voltage Hi (U_S ca. 6,6/7,0 V) Signals passive: O.C, relay, Namur (U_0 ca. 8,5 V; I_S ca. 1,4/1,8 mA)

5 Output

5.1 Output signal

Current, pulse, switching output/status, measuring transducer supply

Output data	Output parameter
Current	Range: 0 … 0.22 mA, active Max. load: > 500 Ω (U0 approx. 12V) Galvanic isolation among each other and to the basic device Error signals: 3.5 mA and 22 mA according to NAMUR NE43 Accuracy: 0.02 % of MV ± 0.002 mA Temperature influence: 0.005 % / K Resolution: 16 Bit
Pulse / Status	Type: Open collector, passive, galvanically isolated Frequency range: 0 ... 100 Hz Min. pulse width: 5 ms ... 500 ms Overload protection: ± 24 V Internal resistance 70 Ω Residual voltage < 1.2 V I_{max}: 20 mA U_{max}: 24 V

5.2 Transducer supply and auxiliary power

Output data	Output parameter
Transducer supply (MUS)	Voltage: 24 V DC Current: Max. 30 mA, short circuit proof
Auxiliary power	Voltage: 24 V DC Current: Max. 250 mA, short circuit proof

6 Characteristic Values

6.1 Reference conditions

Voltage supply: 230 VAC ±10%, 50 Hz ±0.5 Hz
Warm-up time: 10 min
Ambient temperature: 25 °C ±5 °C
Humidity: 39% ±10% r. h.

6.2 Measuring uncertainty

See 4.1

7 Operating Conditions

7.1 Installation conditions

7.1.1 Installation instructions

Please read the operating instructions carefully prior to installation and start-up.

7.1.2 General information

Observe operating data marked on the housing. Also observe data in the order confirmation and on the data sheet. If you wish to use the device under different operating conditions, consult the manufacturer in advance, always state the serial number.

7.1.3 Installation

Various installations are possible:

- Housing with LCD for wall installation
- Housing without LCD for wall installation and separate LCD housing
- Housing for cabinet installation and separate installation of the LCD in the cabinet door
- 19'' plug-in unit design

7.2 Ambient conditions

7.2.1 Ambient temperature

0 °C to +55 °C

7.2.2 Storage temperature

-30 °C to +70 °C

7.2.3 Climate class

In accordance with EN 1434 Class C

7.2.4 Mechanical class

In accordance with EC Directive 2004/22/EC Class M1

7.2.5 Degree of protection

IP65 IEC 529 / EN 60529 (wall installation in plastic housing)
Split mounting: Calculator IP65 with closed cover, Display IP20
IP20 19" cassette

7.2.6 Electromagnetic compatibility

Interference emit:

- EN 61326 Class A

Interference stability:

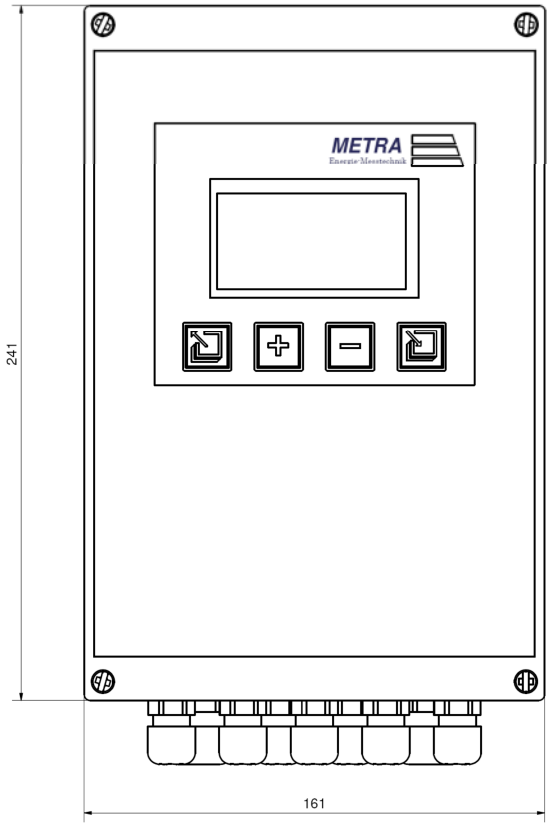
- Power failure: 20 ms, no influence
- Electromagnetic fields: 10 V/m (80 ... 2700 MHz) in accordance with EN 61000-4-3
- Electromagnetic fields: 30 V/m (800 ... 2,000 MHz) in accordance with EN 61000-4-3
- Conducted HF: 0.15 to 80 MHz, 10 V in accordance with EN 61000-4-6
- Electrostatic discharge: 4 kV contact / 8 kV indirect in accordance with EN 61000-4-2
- Burst (AC and DC supply): 4 kV in accordance with EN 61000-4-4
- Burst (signal): 1 kV / 2 kV in accordance with EN 61000-4-4
- Surge (AC and DC supply): 1 kV / 2 kV in accordance with EN 61000-4-5
- Surge (signal): 500 V / 1 kV in accordance with EN 61000-4-5
- EN1434-4 Class C
- EC Directive 2004/22/EC Class E2

8 Constructive Design

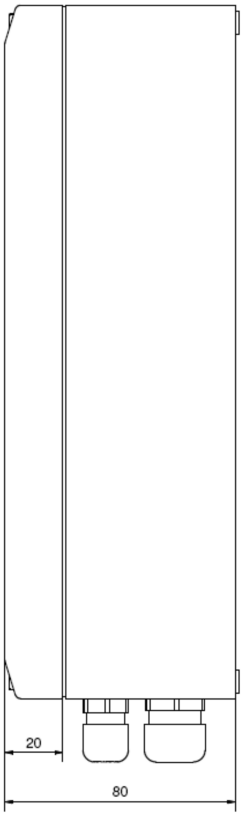
8.1 Model / Dimensions

1. Standard plastic housing

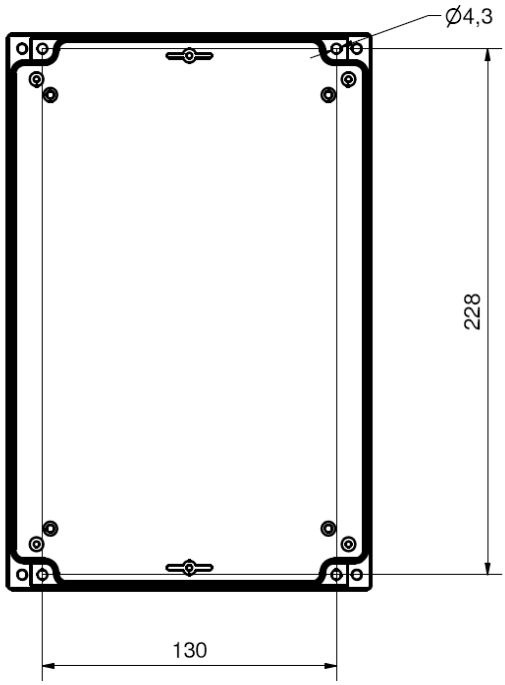
Front view:



Side view:

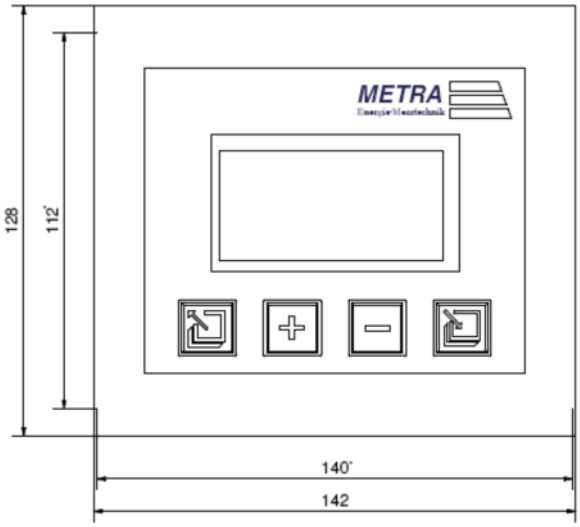


Wall installation:

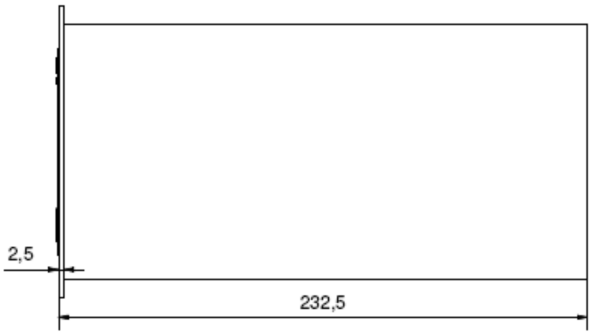


2. 19” plug-in unit design

Front view:



Side view:



All dimensions in mm

8.2 Weight

Standard: Approx. 1 kg
19” plug-in unit design: Approx. 1.5 kg

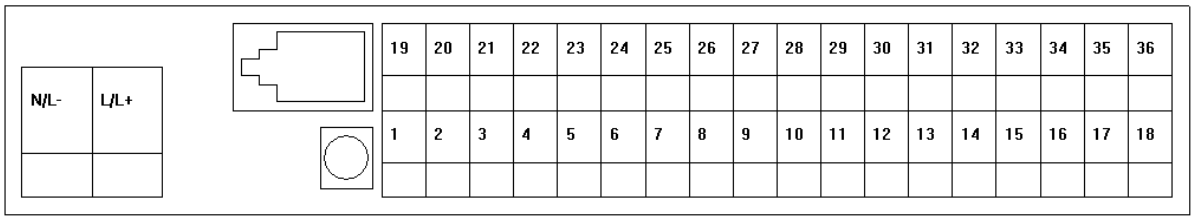
8.3 Material

Standard: ABS -40°C to 80°C, halogen-free
19” plug-in unit design: Aluminum

9 Terminal Assignment

Numbering of the terminals has been altered for the various hardware versions. Hardware version (HV) 3 has 36 double-row terminals; connection to the display occurs via a western plug.

Terminals of basic device

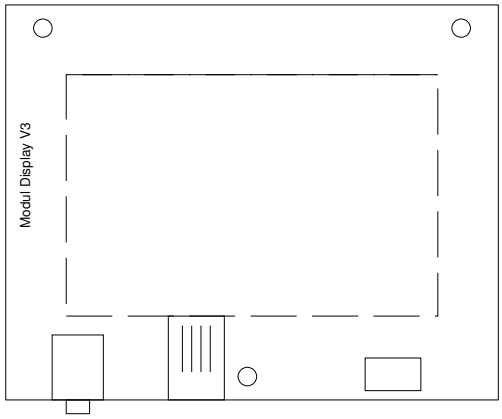


Designation	No.	Function
N \ L-		Neutral conductor 230 V AC Minus 24 V DC
L \ L+		Phase 230 V AC Plus 24 V DC
Disp. 24V	Western	Display supply voltage
Disp. GND	Western	Display supply voltage
Disp. RxD	Western	Serial interface to the display; receive
Disp. TxD	Western	Serial interface to the display; transmit

M-Bus	1	M-Bus interface
M-Bus	2	M-Bus interface
	3	Not occupied
RS232 RxD	19	Serial interface (Modbus); receive
RS232 TxD	20	Serial interface (Modbus); transmit
RS232 GND	21	Serial interface (Modbus); ground
OC 1 +	4	Digital output, open collector
OC 1 -	5	Digital output, open collector
OC 2 +	6	Digital output, open collector
OC 2 -	7	Digital output, open collector
OC 3 +	8	Digital output, open collector
OC 3 -	9	Digital output, open collector
Iout 1 +	22	Current output, galvanically isolated, active
Iout 1 -	23	Current output, galvanically isolated, active
Iout 2 +	24	Current output, galvanically isolated, active
Iout 2 -	25	Current output, galvanically isolated, active
DI 1 +	26	Digital input, (pulse, frequency, status)
DI 1 -	27	Digital input, (pulse, frequency, status)
DI 2 +	28	Digital input, (pulse, frequency, status)
DI 2 -	29	Digital input, (pulse, frequency, status)
Ex 24 V +	10	Auxiliary power for measuring head, galvanically isolated, 24 V
Ex 24 V -	11	Auxiliary power for measuring head, galvanically isolated, 24 V
MUS 1	12	Transducer supply, 24 V, 30 mA
I1	13	Current input
GND	14	Current input 1 ground
MUS 2	30	Measuring transducer supply, 24 V, 30 mA
I2	31	Current input
GND	32	Current input 2 ground
PT1 ++	15	PT 100/500/1000 input, supply
PT1 +	16	PT 100/500/1000 input, Sense
PT1 -	17	PT 100/500/1000 input, Sense
PT1 --	18	PT 100/500/1000 input, supply

PT2 ++	33	PT 100/500/1000 input, supply
PT2 +	34	PT 100/500/1000 input, Sense
PT2 -	35	PT 100/500/1000 input, Sense
PT2 --	36	PT 100/500/1000 input, supply

Terminal assignment display
Connection between basic device and Display is Western RJ10 on both ends.



Terminal assignment modules

Module I-OUT

Designation	**No.**	**Function**
OC 1 +	1	Digital output, open collector
OC 1 -	2	Digital output, open collector
OC 2 +	3	Digital output, open collector
OC 2 -	4	Digital output, open collector
Iout 1 +	5	Current output, galvanically isolated, active
Iout 1 -	6	Current output, galvanically isolated, active
Iout 2 +	7	Current output, galvanically isolated, active
Iout 2 -	8	Current output, galvanically isolated, active

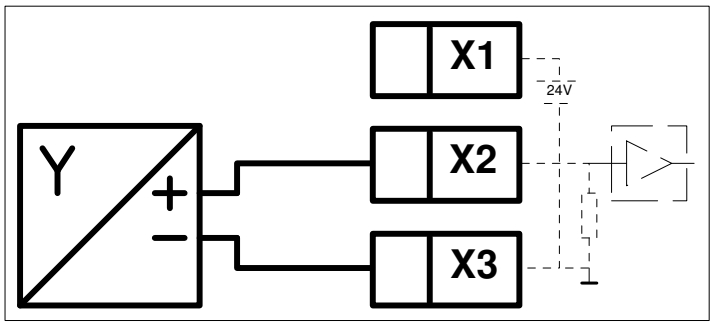
Module I-IN

Designation	**No.**	**Function**
MUS 3	1	Measuring transducer supply, 24 V, 30 mA
I3	2	Current input
GND	3	Current input 3 ground
MUS 4	4	Measuring transducer supply, 24 V, 30 mA
I4	5	Current input
GND	6	Current input 4 ground

10 Connection of External Sensors

10.1 Active sensors

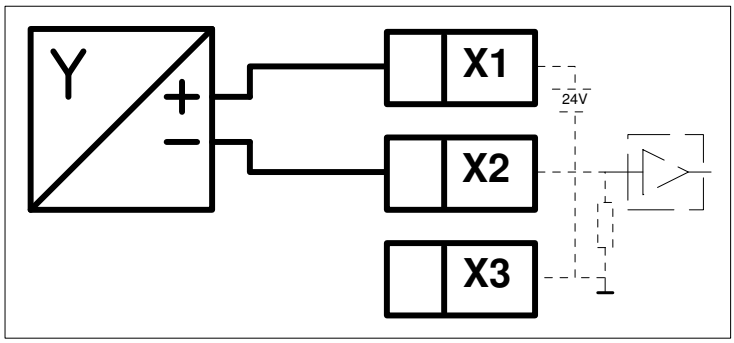
Connection of sensors which have an individual power supply and an active output.



	Terminal	alternative Terminal
X2	13	31
X3	14	32

10.2 Passive sensors

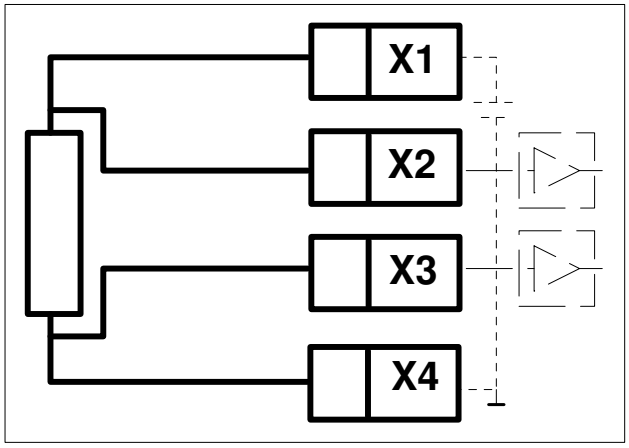
Connection of sensors without a power supply (2-wire sensor).



	Terminal	alternative Terminal
X1	12	30
X2	13	31

10.3 Temperature sensors

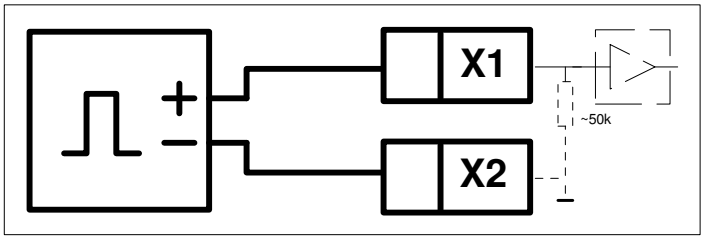
Connection of temperature sensors (PT100, PT500, PT1000). The terminals X1-X2 and X3-X4 must be bridged when connecting 2-wire sensors.
The input has to be configured via the software.



	Terminal	**alternative Terminal**
X1	15	33
X2	16	34
X3	17	35
X4	18	36

10.4 Active digital sensors

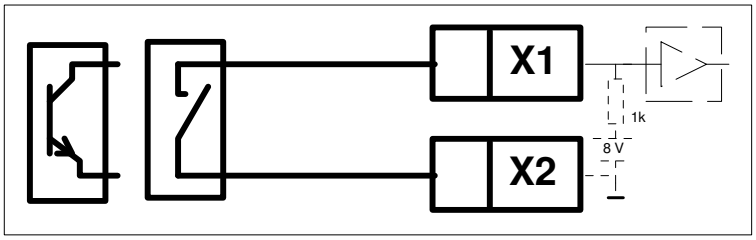
Connection of digital sensors which provide a voltage signal.
The input has to be configured via the software.



	Terminal	alternative Terminal
X1	26	28
X2	27	29

10.5 Passive digital sensors

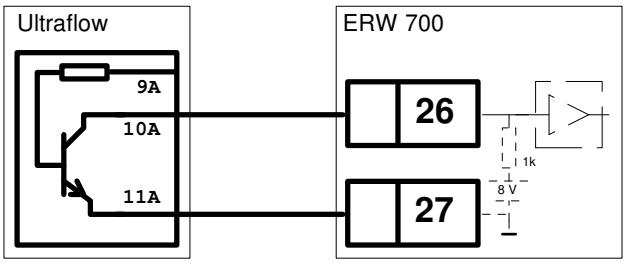
Connection of digital sensors with passive output (relay, open collector, NAMUR).
The input has to be configured via the software.



	Terminal	alternative Terminal
X1	26	28
X2	27	29

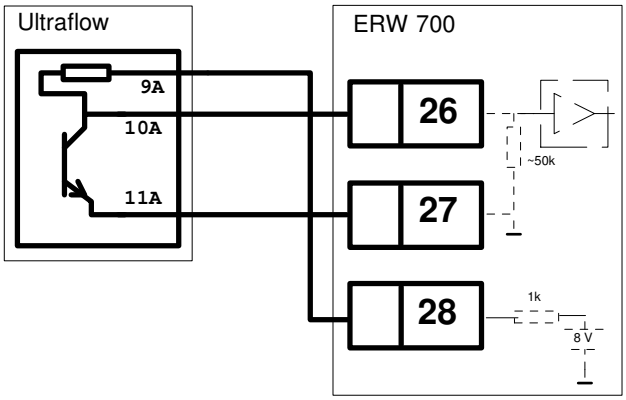
10.6 Ultraflow with Pulstransmitter (EWZ 817)

Connection of an Ultraflow with pulse transmitter.
The wiring diagram between flow transmitter and pulse transmitter as well as the connection of power supply can be read in the Ulraflow manual.
Attention: The Ultraflow- pulstransmitter, as delivered by Kamstrup, can't be used in that wiring scheme. The optic couplers are changed at METRA.



configuration Digital Inputs Level	
DI 1	O.C.
DI 2	-

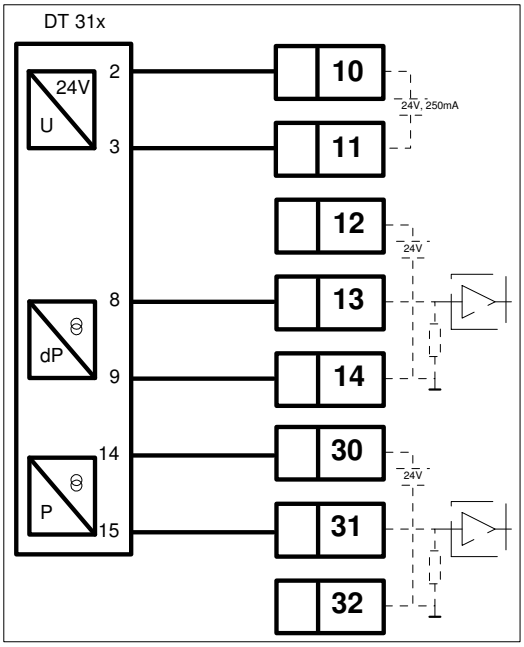
An alternative wiring diagram that can be used with the original pulse transmitter.
The disadvantage is a reduced EMC level.



configuration Digital Inputs Level	
DI 1	U Lo
DI 2	O.C.

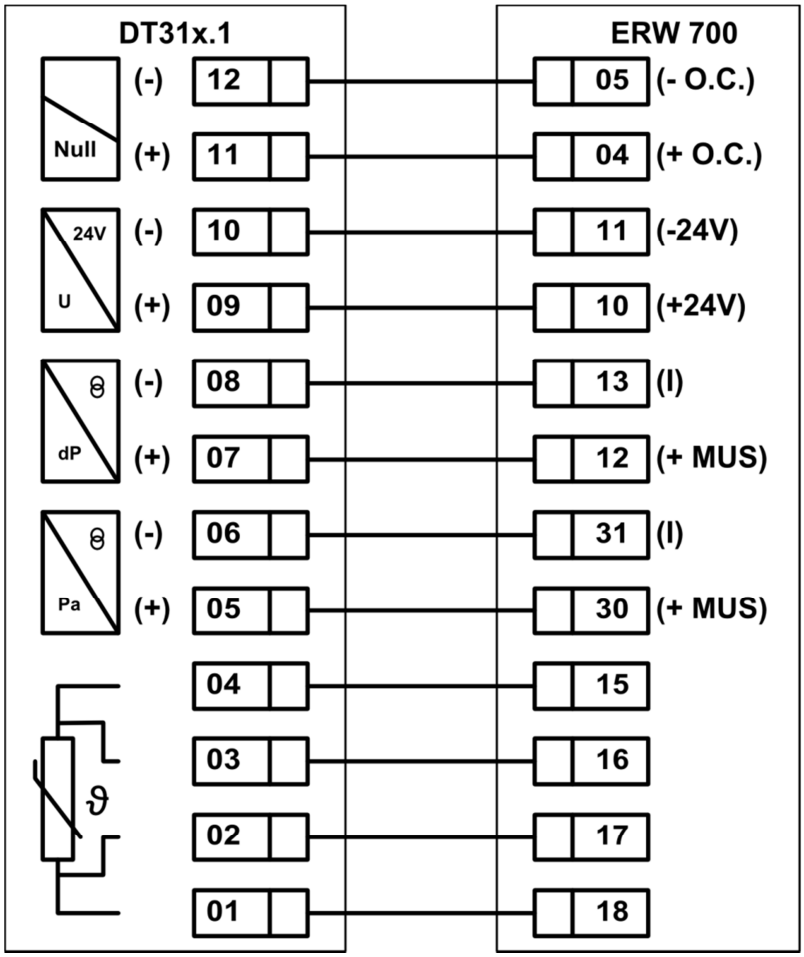
10.7 METRA DT31x

Connection of DT 31x with integrated absolute pressure sensor.



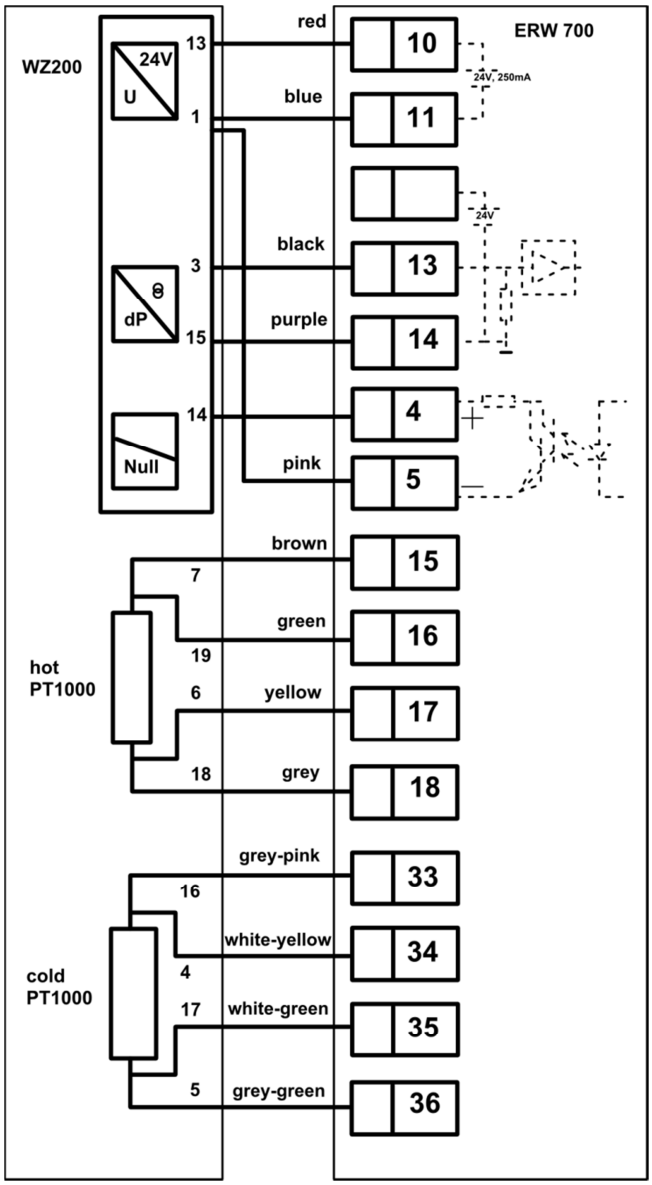
10.8 METRA DT31x.1

Connection of DT 31x.1 with integrated absolute pressure and temperature sensor.



10.9 EWZ 211.7

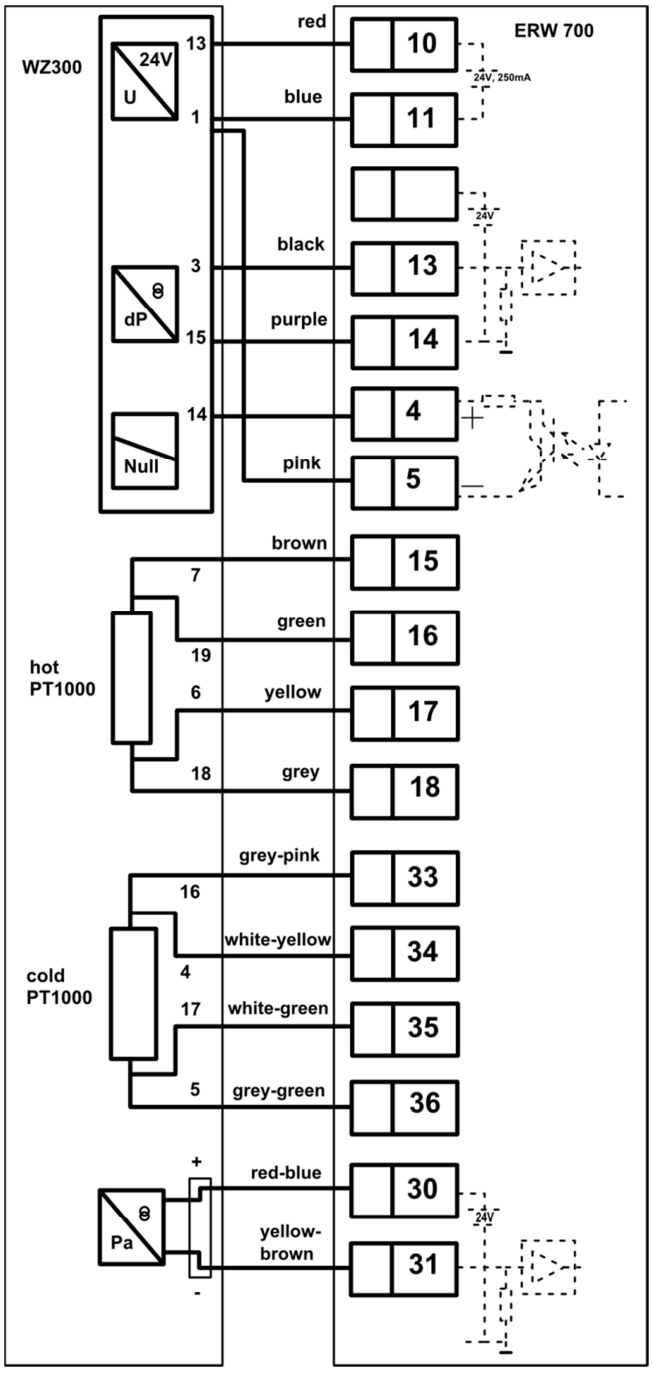
Connection of a WZ 200 (Transmitter of series EWZ 210 and EWZ 211).



Attention!
For controlling of the balancing valve and to measure a current of up to 54 mA a special version of ERW700 is needed. For dp-signal input I1 (terminal 13 + 14) can be used only. Inside the junction box the pink wire has to be removed from terminal 3 and connected to terminal 6 (together with the blue wire).

10.10 EWZ 311.7

Connection of a WZ 300 (Transmitter of series EWZ 311).

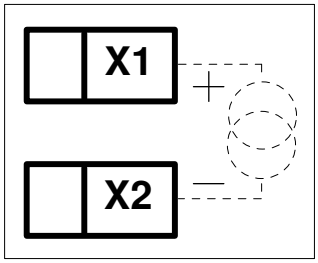


Attention!
For controlling of the balancing valve and to measure a current of up to 54 mA a special version of ERW700 is needed. For dp-signal input I1 (terminal 13 + 14) can be used only. Inside the junction box the pink wire has to be removed from terminal 3 and connected to terminal 6 (together with the blue wire). If there is a pressure transmitter build in, the wires have to be disconnected and with separate wires connected to the ERW700.

11 Output Connection

11.1 Current outputs

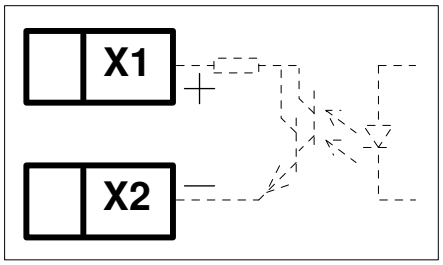
Active current output



	Terminal	Alternative terminals	Alternative module terminals
X1	22	24	5, 7
X2	23	25	6, 8

11.2 Digital outputs

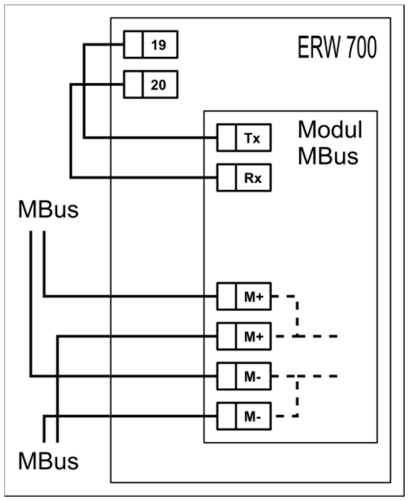
Optic coupler



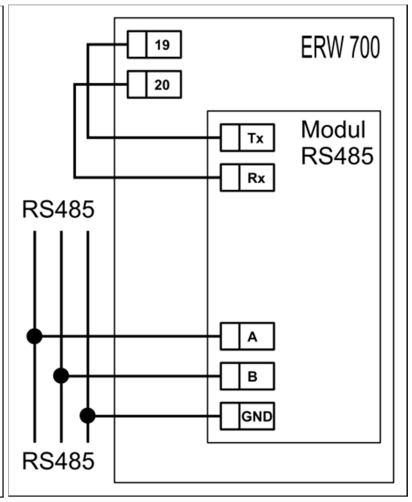
	Terminal	Alternative terminals	Alternative module terminals
X1	4	6, 8	1, 3
X2	5	7, 9	2, 4

11.3 Communication interfaces

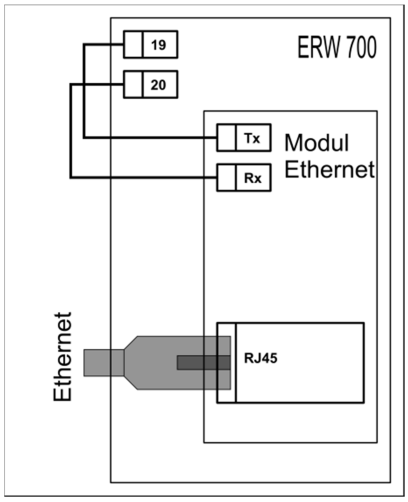
Module M-Bus



Module RS485



Module Ethernet



12 Display and User Interface

12.1 General information

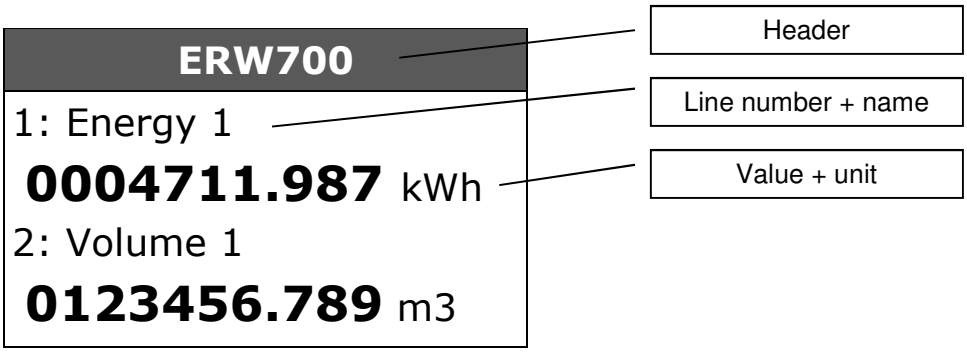
The energy and flow computer ERW 700 is supplied with a factory default setting. Optionally, it can be set to the operating conditions specified in the order. See the enclosed configuration data sheet for the set values.

The energy and flow computer can be configured and operated in two different ways:
1. Programming via Modbus interface
2. On-site operation via membrane keys

12.2 LC display

The graphical LC display allows users to view all the parameters, counters as well as input and output data. Display selection is carried out via keys. The backlight of the display is activated via the respective key. The backlight is set to go off 10 minutes after the last key-press, the device then switches to the standard display.

12.2.1 Display of measured values

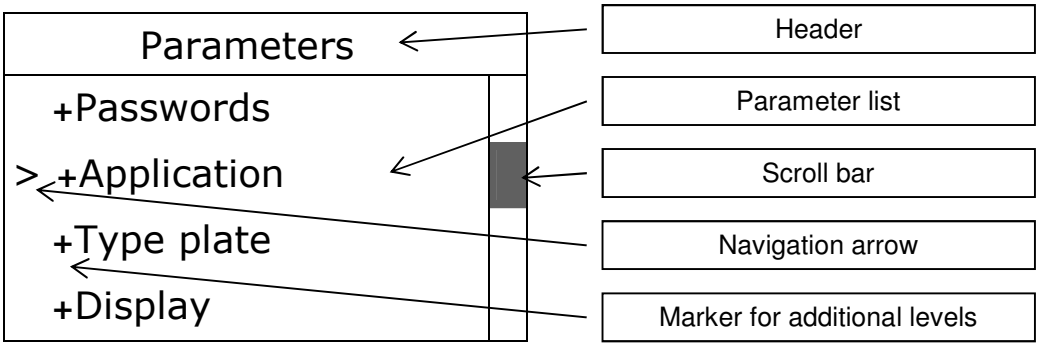


Header:
The display alternates between the programmable TAG number and the error messages.

Line number + name:
The name of the displayed value and also the line number are shown to facilitate orientation. The line number is hidden after approx. 5 s.

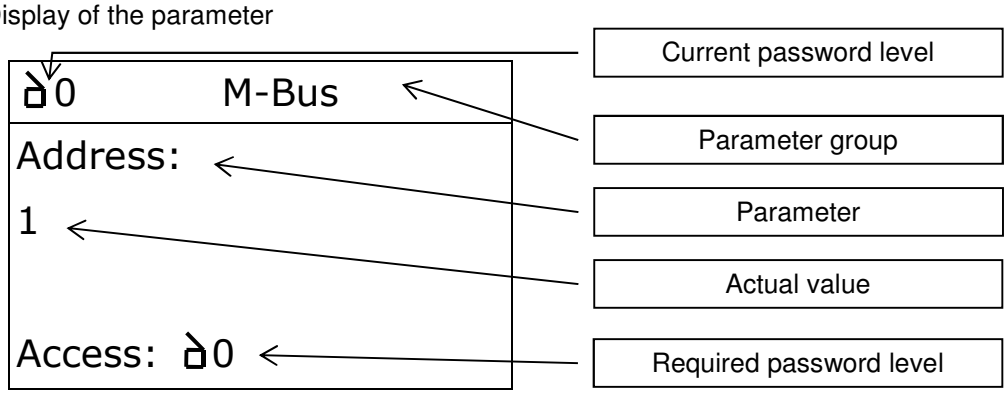
Value + unit:
The value with decimal places and the unit are displayed. The number of decimal places and the unit are parameterizable. The decimal places of the counters can be additionally highlighted by a frame.

12.2.2 Display of parameter navigation

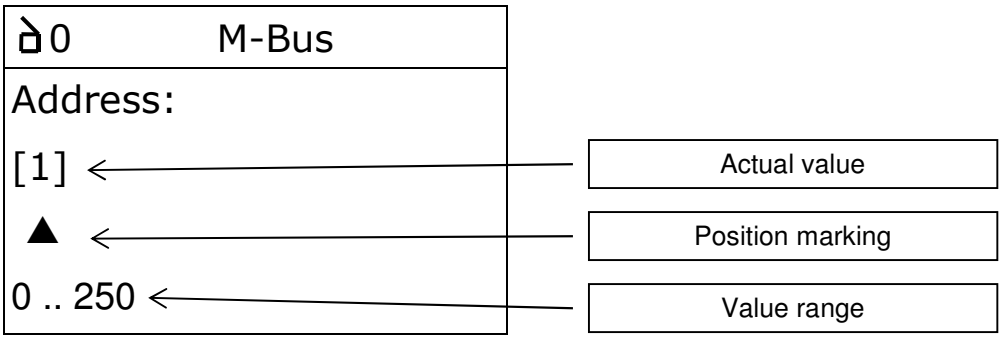


12.2.3 Display of parameters

Display of the parameter

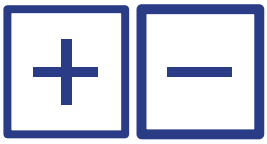
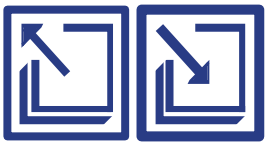


Display when editing the parameter



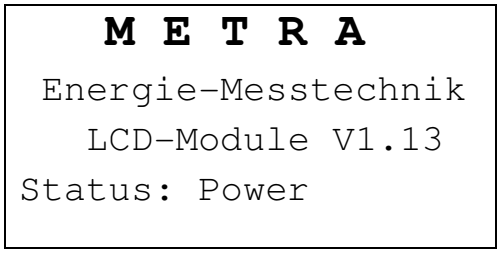
12.3 Operation

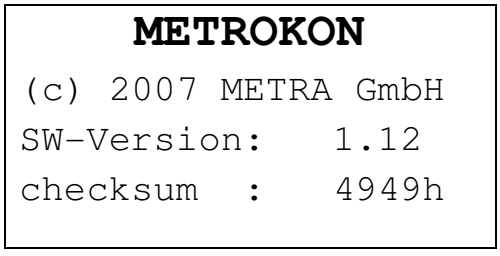
12.3.1 Key functions

Key symbol	Name	Key function
	Back	• Press this key to jump one level higher in the level structure. • If a parameter has been altered, press this key to save the displayed value and to exit programming mode. The saved value is shown on the display.
	Plus	• Press this key to access the next higher level step. • If you are in programming mode, a numerical value increases by +1 or you move one place up a value list.
	Minus	• Press this key to access the next lower level step. • If you are in programming mode, a numerical value decreases by -1 or you move one place down a value list.
	Next	• Press this key to jump one level lower in the level structure. • Once you have reached the desired level, press the key again to activate programming mode and to alter the set values. • With parameters which represent a numerical value, press this key to jump to the next decimal point.
		• Press + and – simultaneously to acknowledge error messages. • An entry can be cancelled in programming mode.
		• Press „Back“ and „Next“ simultaneously to initiate an calibration cycle. (For transmitters with solonoid valves.)

12.3.2 Switching on the meter

The meter does not have an on/off switch Basic initialization is carried out once the meter is connected to the power supply.
The following information is displayed:





The meter subsequently jumps to the set application mode.

12.3.3 Input examples

Example: Calling display values

The data shown below is only an example. Depending on the configuration, more or fewer values can be displayed and the sequence may also vary.

Current display

ERW700
Energy 1
0012345678.5 kWh
Volume 1
0209833823.4 m3

1xMinus

ERW700
3: Power 1:
123.50 kW
4: Vol. flow rate 1:
209.833 m3/h

1xMinus

ERW700
7: Pressure 1
12.005 bar
8: Dp:
310.043 mbar

1xMinus

ERW700
1: Energy 1
0012345678.5 kWh
2: Volume 1
0209833823.4 m3

1xMinus

ERW700
5: Temperature 1
72.58 °C
6: Temperature 2
15.34 °C

Example: Password Level1 = enter 0009

Current display

```
        ERW700
Energy 1
      001234567.5 kWh
Volume 1
       020983382.4 m3
```

1 ... 2xNext

```
          Menu
▶ +  Information
  +  Logbook
  +  Parameter
```

2xPlus

```
          Menu
  +  Information
  +  Logbook
▶ +  Parameter
```

1xNext

```
       Parameters
▶ +  Passwords
  +  Application
  +  Type label
  +  Display
```

1xNext

```
       Parameters
▶    Password level1
     Password level2
     Password level3
     Password level4
```

1xNext

```
#0      Passwords
Password Level1:
****

Access: #0
```

1xNext

```
#0      Passwords
Password level1:
****
▲
0 ... 9999
```

1xPlus

```
#0      Passwords
Password level1:
0***
▲
0 ... 9999
```

1xNext

```
#0      Passwords
Password level1:
0***
 ▲
0 ... 9999
```

1xPlus

```
#0      Passwords
Password level1:
00**
 ▲
0 ... 9999
```

1xPlus

```
#0      Passwords
Password level1:
000*
  ▲
0 ... 9999
```

1xMinus

```
#0      Passwords
Password level1:
0009
   ▲
0 ... 9999
```

1xBack

```
#1      Passwords
Password level1:
Level free

0 ... 9999
```

5xBack

```
        ERW700
Energy 1
      001234567.5 kWh
Volume 1
       020983382.4 m3
```

Finished!!

Example: Changing the date from 28.6.07 to 18.07.07

Current display

```
        ERW700
Energy 1
      001234567.5 kWh
Volume 1
       020983382.4 m3
```

1xNext

```
       Parameter
    + Temperature
    + Limit values
    + Outputs
►   + Clock
```

3xNext

```
#1          Clock
Date:
[18.06.07]
     ▲
01.01.00...31.12.99
```

1 ... 2xNext

```
          Menu
►   + Information
    + Logbook
    + Parameter
```

1xNext

```
          Clock
►     Date
      Time
      Quartz corr.
```

1xPlus

```
#1          Clock
Date:
[18.07.07]
     ▲
01.01.00...31.12.99
```

2xMinus

```
          Menu
    + Information
    + Logbook
►   + Parameter
```

1xNext

```
#1          Clock
Date:
28.06.07

Access: #1
```

1xBack

```
#1          Clock
Date:
18.07.07

Access: #1
```

1xNext

```
       Parameters
►   + Passwords
    + Application
    + Type plate
    + Display
```

1xNext

```
#1          Clock
Date:
[28.06.07]
 ▲
01.01.00...31.12.99
```

6xBack

```
        ERW700
Energy 1
     001234567.5 kWh
Volume 1
     020983382.4 m3
```

13xMinus

```
       Parameters
    + Temperature
    + Limit values
    + Outputs
►   + Clock
```

1xMinus

```
#1          Clock
Date:
[18.06.07]
 ▲
01.01.00...31.12.99
```

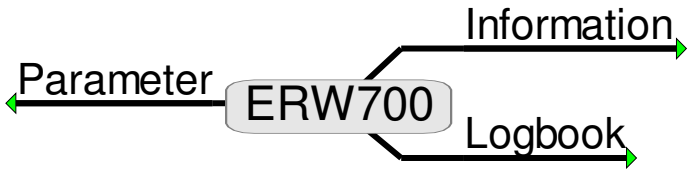
Finished!!

13 Parameters

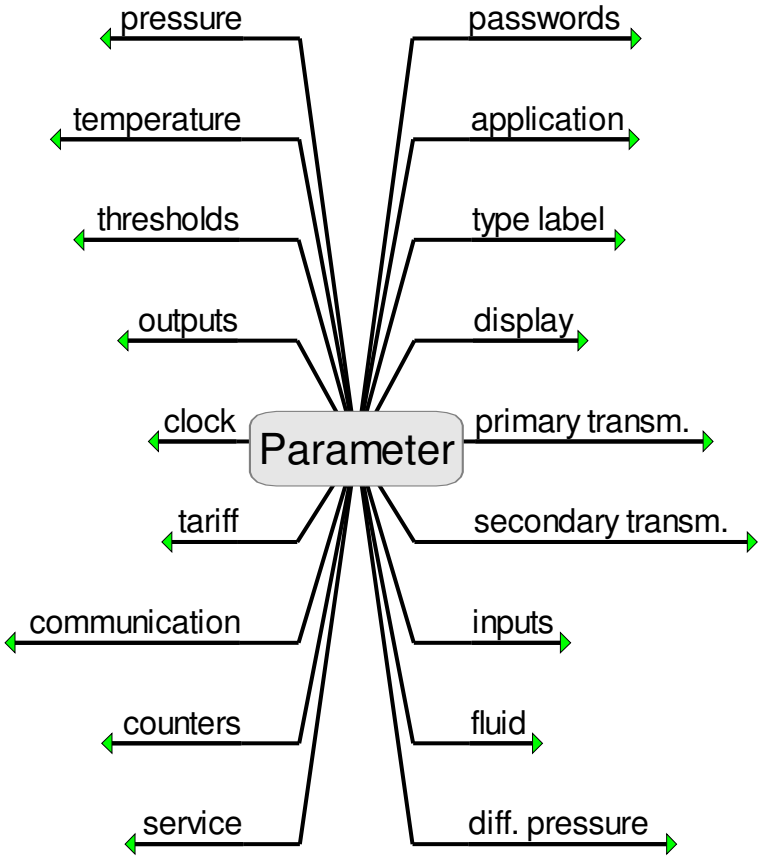
13.1 Parameter menu structure

The operating menu is arranged as a tree structure. To illustrate the structure, certain levels are displayed below as a mind map. Branches without a dot are end branches, branches with a dot at the end continue to the next lower level. The data shown below is only an example. Depending on the configuration and released password level, only part of the menu tree is visible.

13.1.1 Level 1



13.1.2 Level 2



14 Parameter Description

14.1 Application

Standard settings may be marked in **bold**.

14.1.1 Basic application

The application specifies the basic characteristics. It is generally used to selectively control the parameter list, i.e. many of the parameters which are not required are hidden. At the same time some functions in the device are (de-)activated, e.g. energy-relevant values are only calculated if energy has been selected. All functions can be set flexibly in the “Free configuration” setting.

Set to "Volume dp" is pre-configured the device for a volume or mass measurement with differential pressure transducer (orifice, venturi, etc.). Set to "Energy dp" energy comes to that.

Set to "Volume Q" is pre-configured the device for a volume or mass measurement with standard volume or mass flow meters (Ultrasonic, Vortex, Turbine, etc.). Set to "Energy Q" energy comes to that.

Selection:

Free configuration	Volume Q	Energy Q
Volume dp	Energy dp	DIMU

14.1.2 Language

Setting the dialog language

Selection: **German**, English

14.1.3 Additional counters

Additional counters can be defined in the “Free configuration” setting. A total of 3 counter sets (energy, mass, volume, standard volume) are available; however, only 2 are actually physically available and saved. The third set is only displayed as a sum or difference. With 1-channel operation, it is possible to toggle between 2 counters in an event-controlled manner. The event can be an error, a limit value or an external control signal.

Selection:

Without	Error	D2
2-channel	Sum/Error	D2 inv.
Difference	Saturated steam	Threshold 2
Sum	Sum/Saturated steam	Threshold 2 inv.

14.2 Type plate

14.2.1 Serial number

The factory-defined serial number is for information purposes only.

14.2.2 TAG number

A measuring point number (TAG) can be entered. This is shown in the header of the display. If no text is entered, the header is not displayed.

Range: 15 alphanumerical digits

14.2.3 Text 1 ... 4

4 lines of text can be entered. These are for information purposes only and do not have any further functions. For example, the order and serial number of the volume measuring device could be entered here.

Range: 15 alphanumerical digits

14.3 Display

The display can be freely configured within the broad limits. All the measuring values and relevant calculation values can be displayed. The format and unit can be selected. Several values can be compiled as pages; it is then possible to leaf through these pages.

14.3.1 Counter frame

A frame can be shown to specifically indicate the decimal places for counters. (PTB and MID regulation)

123456.789 kWh

Selection: **No**, Yes

14.3.2 Line number 0 … n

List value assignment to a line in the display. If 0 is entered, the value is not displayed. If the same line number is assigned to several values, they are displayed alternately.

14.3.3 Decimal place 1 … n

Selection of the display format

14.3.4 Units 1 … n

Selection of the displayed unit. The selected unit does not influence the calculations. The internal calculation is always in basic units. Conversion only takes place for display purposes.

14.4 Primary transmitter

14.4.1 Sensor selection

Selection of the volume / mass sensor.

Selection:

Throttle dp 0/4-20mA	Mass 0/4-20mA	Mass pulse
Volume 0/4-20mA	Volume pulse	

14.4.2 Input

Electrical assignment of the sensor to the input. If a throttle is selected as the sensor, assignment takes place via the differential pressure input. Select a current input for volume / mass sensors with a current signal (I1 ... I4) and a digital input for sensors with a pulse (DI1 ... DI2).

Range: I1, I2, I3, I4, DI1, DI2

14.4.3 Primary nominal flow rate

The nominal flow rate determines the measuring range (maximum value) of the connected volume / mass sensor. It is the 100% point for calculating the crawl flow shut-off. If the primary sensor is a throttle device, enter the mass nominal flow rate (qn) in kg/h.

Range: 0.10 m3/h ... 1e9 m3/h (or kg/h)

14.4.4 Primary pulse value

If a pulse pick-up (volume or mass) is selected as the volume sensor, the pulse value is set here.

Range: 0.10 pulse/m3 ... 1e8 pulse/m3 (or pulse/kg)

14.4.5 Leak flow mode

Set whether the quantities below the leak flow rate are counted or not. In “With” mode, all pulses are counted and converted, even if the actual value of the flow rate is below the leak flow rate. In “Without” mode, pulses are not counted below the leak flow rate.

Selection: **With**, Without

14.4.6 Primary leak flow

Set the crawl flow shut-off in % of the nominal flow rate.

Range: 0 ... 10 %

14.4.7 Place of installation

In Energy mode, the volume / mass sensors can be installed in the supply and return. In Flow meter mode (no energy), the “Warm” place of installation is automatically set.

Selection: Cold, Warm

14.4.8 Minimum measuring time

Set the minimum measuring time for the frequency measurement. This way it is possible to adapt the measuring time to the behavior of pulse pick-ups which do not output equidistant pulses.
Ideal values for: Kamstrup 1000 ms, Hydrometer 2000 ms.

Range: 100 ms ... 2500 ms

14.5 Orifice

14.5.1 Orifice type

Selection of the throttle.

Selection:

Cross probe	Orifice plate D-D/2	Venturi nozzle
Orifice plate corner	ISA nozzle	Venturi tube
Orifice plate flange	Quarter-circle nozzle	Dynamic probe

14.5.2 Flow coefficient

The flow coefficient determines the measuring range for autarkon sensors (cross probe).

Range: 1.00 m3/h ... 10000.00 m3/h

14.5.3 Flow rate correction

Determined flow rate correction factor, deviation from the standard.
If the throttle device is a venturi tube, it is possible to enter the flow rate coefficient here. Characteristic line corrections are carried out via linearization.
Default: 1.000

Range: 0.5000 ... **1.000** … 2.000

14.5.4 Pipe diameter

Internal diameter of the supply pipe.

Range: 10 ... 1500 mm

14.5.5 Bore diameter

Internal diameter of the orifice bore

Range: 3 ... 1500 mm

14.5.6 TC pipe

Temperature coefficient of the supply pipe, e.g. tc(V2A)=16 E-6 1/K

Range: 1 ... 100 E-6 1/K

14.5.7 TC bore

Temperature coefficient of the bore.

Range: 1 ... 100 E-6 1/K

14.6 Linearization

14.6.1 Linearization

Selection of the characteristic line correction of the flow sensor or throttle device.

Selection: **Without**, Q, Re, Re + Ex

14.6.2 Q/Re-Lin parameter 1 ... 7

The parameters are used for linearizing the flow rate characteristic line. The flow rate coefficient is corrected depending on the Reynolds' number or the flow rate. Wet calibration has to be carried out to determine the parameters.

Range: According to parameter

14.6.3 Ex-Lin parameter

This parameter is used for linearizing the expansion number. The expansion number is corrected depending on the pressure ratio. Wet calibration has to be carried out to determine the parameter.

Range: -1e9 ... +1e9

14.7 Secondary transmitter

14.7.1 Secondary transmitter selection

Selection of the volume / mass sensor in the second measuring circuit.

Selection:

Without	Mass 0/4-20mA	Mass pulse
Volume 0/4-20mA	Volume pulse	

14.7.2 Secondary input

Electrical assignment of the sensor to the input. Select a current input for volume / mass sensors with current signal (I1 ... I4) and a digital input for sensors with a pulse (DI1 ... DI2).

Selection: I1, I2, I3, I4, DI1, DI2

14.7.3 Secondary nominal flow rate

The nominal flow rate determines the measuring range (maximum value) of the connected volume / mass sensor. It is the 100% point for calculating the crawl flow shut-off.

Range: 0.10 m3/h ... 1e9 m3/h (or kg/h)

14.7.4 Secondary pulse value

If a pulse pick-up (volume or mass) is selected as the volume sensor, the pulse value is set here.

Range: 0.10 pulse/m3 ... 1e8 pulse/m3 (or pulse/kg)

14.7.5 Secondary leak flow rate

Set the leak flow shut-off in % of the nominal flow rate.

Range: 0 ... 10 %

14.8 Inputs

14.8.1 PT inputs

Selection of the temperature sensor type.

Selection: PT100, PT500, PT1000

14.8.2 Current input level

Selection of the current input level.

Selection: 0 ... 20 mA, **4 ... 20 mA**

14.8.3 Digital input level

Selection of the digital input level. U Lo is for voltage signals with a low level (e.g. 5 V), U Hi is for voltage signals with a high level (e.g. 24 V) and O.C. is for passive signals (e.g. Open Collector, NAMUR, relay). For suppressing noise or contact bounce a low-pass filter (about 50 Hz) can be enabled.

Selection:

U Lo	U Hi	**O.C.**
U Lo low pass	U Hi low pass	O.C. low pass

14.9 Fluid

14.9.1 Fluid

Selection of the fluid. The density, enthalpy and dynamic viscosity for standard media are calculated according to internally defined methods. The polynomial coefficient for the relevant measuring range has to be determined and entered separately for special media. Saturated steam can be pressure (P) or temperature (T) controlled.

Selection:

Water	Steam	Special fluid
Saturated steam_T	Air / Gas	
Saturated steam_P	Air / Gas ReKw	

14.9.2 Nominal density

The standard density (T=273.15 K and P=1.01325 bar) is entered here for air or other gaseous media. Water and steam are calculated internally with the respective fixed values.

Range: 0.5 kg/m^3 ... 2000 kg/m^3

14.9.3 Reference pressure

The pressure for the status on which the conversion is to be based is entered here.
This is of interest where, depending on the application, various “standard statuses” are common (e.g. air 1 bar). The calculation is carried out for all the media.
The reference pressure and reference temperature are used to internally calculate the reference density.

Range: 0.5 bar ... **1.01325** … 20.0 bar

14.9.4 Reference temperature

The temperature for the status on which the conversion is to be based is entered here.
This is of interest where, depending on the application, various “standards” are common (e.g. mineral oil 15°C). The calculation is carried out for all the media.
The reference pressure and reference temperature are used to internally calculate the reference density.

Range: **0 °C** ... 100.0 °C

14.9.5 Critical pressure

The compressibility for gas can be calculated according to Redlich Kwong. The critical pressure is a parameter and is entered here. Refer to the literature for the values of various media.

Range: 1.0 bar ... 2000.0 bar

14.9.6 Critical temperature

The compressibility for gas can be calculated according to Redlich Kwong. The critical temperature is a parameter and is entered here. Refer to the literature for the values of various media.

Range: 1 K ... 2000 K

14.9.7 Isentropic exponent

If the primary sensor is an orifice, the isentropic exponent is entered here. Refer to the literature for the values of various fluids.

Range: 1.1 ... 3

14.9.8 Compressibility

If the primary sensor is an orifice, the compressibility is entered here. Refer to the literature for the values of various media.

Range: 0.5 ... **1.0** … 2

14.9.9 Saturated steam monitor

The steam status can be monitored for steam measurements. If the steam exceeds the saturated steam line, an error message can be optionally generated.

Selection: **No**, Yes

14.10 Special fluid

14.10.1 Density determination

Control of density determination. If set to default, calculation occurs with a constant density. With P-T (default), the medium as well as the pressure and temperature are used to calculate the density. The density can also be handled as a measured value via current or frequency.

Selection: default, **P-T** , 0/4..20mA, Frequency

14.10.2 Density input

Electrical assignment of the sensor to the input. Select a current input for density sensors with a current signal (I1 ... I4) and a digital input for sensors with a frequency (DI1 ... DI2).

Range: I1, I2, I3, I4, DI1, DI2

14.10.3 Density measuring parameter 0 ... 1

Polynomial coefficients for calculating the density from the measured values current / frequency.

Range: -1e37 ... +1e37

14.10.4 Density default

Preset value for the density.

Range: 0.1 ... 2,000 kg/m³

14.10.5 Density end value

Maximum value (end value) of the density sensor at 20 mA.

Range: 0.0 kg/m3 ... 10,000.0 kg/m3

14.10.6 Density start value

Minimum value (start value) of the density sensor at 0/4 mA.

Range: 0.0 kg/m3 ... 10,000.0 kg/m3

14.10.7 Parameter special fluid density

Polynomial coefficients for calculating the density (spec. volume) of special fluid SO1- SO2. (These are also used for linearization during density measurement.?)
Density [kg/m³] = SO1 + SO2 * T
Density SO1 [kg/m³] = density at 0 °C
Density SO2 [kg/(m³K)] = linear density development
T [°C] = temperature
SO1 = density value and SO2 = 0 are set for calculating with constant density.

With Bopp & Reuther density meter:
Density SO1 = KB0
Density SO2 = KB1 *10^4
Density SO3 = KB2 * 10^8

Parameters for temperature correction: (from V1.25)
Density KBT0 [kg/m³/K]
Density KBT1 [1/K]
Density TK [°C]

Range: -1e37 ... +1e37

14.10.8 Parameter special fluid enthalpy

Polynomial coefficients for calculating the enthalpy of special fluid SO1- SO2.
Enthalpy [kWh/kg] = SO1 * T + SO2 * T^2
Enthalpy SO1 [kWh/(kgK)] = specific thermal capacity
Enthalpy SO2 [kWh/(kgK^2)] = gradient of the specific thermal capacity
T [°C] = temperature

Range: -1e37 ... +1e37

14.10.9 Parameter special fluid dynamic viscosity

Polynomial coefficients for calculating the dynamic viscosity of special fluid SO1 – SO3.
dyn. viscosity [Ns/m^3] = 1 / (SO1 + SO2 * T + SO3 * T^2)
dyn. viscosity SO1 [m^2/(Ns)]
dyn. viscosity SO2 [m^2/(NsK)]
dyn. viscosity SO3 [m^2/(NsK^2)]
T [°C] = temperature

Range: -1e37 ... +1e37

14.11 Special fluid concentration

Available from software version V1.30

14.11.1 Mode

Control of the calculation of concentration. If set to preset the calculation is done with a fixed value. If set to current input the concentration has to be supplied by an external device.

Auswahl: without, preset, 0/4..20mA

14.11.2 Input

Electrical assignment of the current input to the measured value.

Bereich: I1, I2, I3, I4

14.11.3 Preset value

Preset (const) value for the concentration.

Bereich: 0 ... 100 %

14.11.4 End Value

Maximum value (end value) of the concentration at 20 mA.

Bereich: 0 ... 100 %

14.11.5 Start value

Minimum value (start value) of the concentration at 0/4 mA.

Bereich: 0 ... 100 %

14.11.6 Parameters

Additional polynom coefficients for calculation oft he concentration.
Density SO3, Density SO4, Enthalpie SO3, Enthalpie SO4, dyn. Viskosity SO4, dyn. Viskosity SO5.

Bereich: -1e37 ... +1e37

14.12 Differential pressure

14.12.1 dp mode

Operating mode for the differential pressure sensor

Selection:	Preset	Calculation with preset value (only for test purposes)
	ST	Measurement with 1 sensor
	ST rad	Measurement with 1 sensor square rooted
	DT	Measurement with 2 sensors

DT rad	Measurement with 2 sensors square rooted
EWZ211	Connected to a WZ200 transmitter
DT31x.1	Connected to a DT31x1 transmitter
DT31x.1 rad	Connected to a DT31x1 transmitter square root

14.12.2 dp preset

Preset value for the differential pressure. Only for test purposes.

Range: -3000.0 ... +3000.0 mbar

14.12.3 dp averaging

Factor for the average determination of the differential pressure.
Default = 1

14.12.4 dp offset

Use the dp offset to correct static offset of the differential pressure caused by the sensor or installation. The set value is subtracted from the measured value.

Range: -10.0 mbar ... +10.0 mbar

14.12.5 dp1/2 end value

Maximum value (end value) of the dp sensor at 20 mA.

Range: 1.0 mbar ... 10,000.0 mbar

14.12.6 dp1/2 start value

Minimum value (start value) of the dp sensor at 0/4 mA.

Range: 1.0 mbar ... 10,000.0 mbar

14.12.7 dp1/2 input

Electrical assignment of the current input to the measured value.

Range: I1, I2, I3, I4

14.12.8 Balancing time factor

Factor to control time between to balancing cycles.

Range: 1 … **2** … 54

14.12.9 Balancing waiting time

Lasting off the balancing time.

Range: 1000 … **2500** … 10000 ms

14.12.10 Balancing limit

Limit to control balancing. Above that limit an auto balancing is not performed.

Range: 1 … **5** … 500

14.12.11 Balancing averaging

Averaging factor during auto balancing.

Range: **4** … 100

14.13 Pressure

14.13.1 Air pressure

Air pressure for correcting the relative pressure sensors.

Range: 0.500 ... 1.000 … 1.200 bar

14.13.2 PressureQKorr

Correcting the pressure as a function of the flow rate.
P_k = P + PessureQKorr * Density * Qb^2

Range: -1e37 ... +1e37

14.13.3 Mode pressure 1 ... 2

Operating mode for the pressure sensor. The absolute pressure is corrected with –50% of the dp for the cross probe.

Selection:

without	0/4-20 mA rel.	0/4-20 mA abs cross probe
preset	0/4-20 mA abs.	0/4-20 mA abs QKorr

14.13.4 Preset pressure 1 … 2

Preset value for the pressure. If the "Absolute pressure mode" is set to "Preset", all calculations are carried out with this preset value. If a pressure sensor is connected, this value is only used for calculation if a measuring fault has occurred.

Range: -1 bar ... 200 bar

14.13.5 End value pressure 1 … 2

Pressure at which the pressure sensor supplies 20 mA.

Range: -1 ... 200 bar

14.13.6 Start value pressure 1 … 2

Pressure at which the pressure sensor supplies 0/4 mA.

Range: -1 ... 200 bar

14.13.7 Offset pressure 1 … 2

Offset value of the pressure measurement. This way it is possible to compensate for hydrostatic pressure caused by the installation. It is also possible to correct the air pressure of relative pressure sensors here. The entered value is subtracted from the measured value.

Range: 0.00 bar ... 2.00 bar

Example:
In case of a separate installation and a height difference of 4.5 m between the tube center (with steam: Condensate level) and the sensor center, a value of 0.45 bar has to be set. When installing a relative pressure sensor, the air pressure (approx. 1 bar) has to be subtracted from the determined value.

14.13.8 Input pressure

Electrical assignment of the current input to the measured value.

Range: I1, I2, I3, I4

14.14 Temperature

14.14.1 Temperature mode 1 … 2

Operating mode for the temperature sensor (PTxxxx).

Selection:	Preset	Calculation with preset value
	PT100..1000	Measurement PT100, PT500, PT1000
	0/4..20mA	Measurement via current input 1 … 4

14.14.2 Preset temperature 1 … 2

Preset value for the temperature. If the "Temperature mode" is set to "Preset", all calculations are carried out with this preset value. If a temperature sensor is connected, this value is only used for calculation if a measuring fault has occurred.

Range: -50 °C ... 600 °C

14.14.3 Temperature input

Electrical assignment of the input to the measured value.

Range: PT1, PT2, I1, I2, I3, I4

14.14.4 Temperature end value 1 ... 2

Scaling of the temperature input in the current input mode.
Temperature at which the sensor supplies 20 mA.

Range: -50 °C ... 1000 °C.

14.14.5 Temperature start value 1 ... 2

Scaling of the temperature input in the current input mode.
Temperature at which the sensor supplies 0/4 mA.

Range: -50 °C ... 1000 °C.

14.15 Thresholds

The thresholds are used to monitor individual actual values. They can be used to control the digital inputs or to toggle between 2 counters.

14.15.1 Threshold selection 1 ... 2

Selection of the data for threshold monitoring.

Selection:

Off	Density [kg/m³]	QN 2 [m3/h]
Differential pressure [mbar]	QB1 [m3/h]	QM 2 [t/h]
Abs. pressure. [bar]	QN1 [m3/h]	P2 [kW]
Temperature 1 [°C]	QM1 [t/h]	Concentration
Temperature 2 [°C]	P1 [kW]	
Diff. Temperature [°C]	QB2 [m3/h]	

14.15.2 Top / Bottom threshold 1 ... 2

Switching point for the threshold. Ensure that the upper and lower value are different. The hysteresis results from the difference.

Range: - 1e-37 ... +1e37

14.16 Digital outputs

The digital outputs are universal digital outputs. They can be used for status messages (error, limit value, crawl flow rate) as well as for pulse output of the counters.

14.16.1 Digital output mode 1 ... 3(7)

Selection of the digital output operating mode.

Selection:

Off	VB1 [m3]	Energy2 [kWh]
Error	VN1 [m3]	Low flow 1
Error inverted	Mass1 [t]	Low flow 1 inv.
Limit 1 value	Energy1 [kWh]	Low flow 2
Limit 1 value inverted	VB2 [m3]	Low flow 2 inv.
Limit 2 value	VN2 [m3]	Balancing
Limit 2 value inverted	Mass2 [t]	

14.16.2 Pulse value digital output 1 ... 3(7)

Value of the output pulse. The unit always corresponds to the selected data.

Range: 0.01 pulse/unit ... 10000 pulse/unit

14.16.3 Min. pulse width

Minimum pulse / pause width of the pulse outputs. The setting applies to all the pulse outputs. The smallest value is 5 ms, for the module outputs 1 ms. Since software version V1.14 this parameter is only valid for the module outputs, the outputs basic outputs have a duty cycle of about 1:1.

Range: 1 ms … 500 ms.

14.17 Current output

14.17.1 Selection current output 1 ... 2(6)

Selection of the current output.

Selection:

Inactive	Pa 2 [bar]	P [kW]
0 mA	T [°C]	Qb 2 [m3/h]
4 mA	T 2 [°C]	Qn 2 [m3/h
20 mA	dT [°C]	Qm 2 [t/h]
Preset value	Density [kg/m³]	P 2 [kW]
dP [mbar	Qb [m3/h]	Concentration
dP rad. [mbar]	Qn [m3/h]	
Pa [bar]	Qm [t/h]	

14.17.2 Preset current output 1 ... 2(6)

Preset value for checking the current transmission and for test purposes.

Range: 0 ... 22 mA

14.17.3 Current output end value 1 ... 2(6)

Scaling of the current output.

Range: -50 ... 100000.

14.17.4 Current output start value 1 ... 2(6)

Scaling of the current output.

Range: -50 ... 100000.

14.17.5 Current output time constant 1 ... 2(6)

Damping factor for the current output. Tau ~ n * 125 ms.

Range: n = 1 ... 255

14.17.6 Current output error behaviour 1 ... 2(6)

Behaviour of the current output if an error occurs. Depending on the setting, the current output retains its value or changes the set constant current. This can be used for remote transmission of the error message if supported by the evaluation device.

Selection: **Without**
Preset
0 mA (equivalent to min. or line break)
3.5 mA
4 mA (equivalent to min.)
20 mA (equivalent to max.)
22 mA

14.17.7 Current output level 1 ... 2(6)

Selection of the current output level.

Selection: 0 ... 20 mA, 4 ... 20 mA

14.18 Clock

14.18.1 Date

Display and setting of the date.

Range: 01.01.00 ... 31.12.99

14.18.2 Time

Display and setting of the time.

Range: 00:00:00 ... 23:59:59

14.18.3 Quartz correction

Correction of the real time clock.

Range: 0,999005 ... 1,00019

14.19 Tariff

14.19.1 Fixed 1 ... 2

Enter the day on which the counters are to be saved.

Range: 01.01. ... 31.12.

14.19.2 Data log mode

Operating mode of the data logger. It is determined which data is to be saved. Only the primary counters (Cnt. 1), the primary counters and the flow values (Cnt. + Flow 1..2), primary and secondary counters (Cnt. 1..2) or the primary and secondary counters and flow values (Cnt. + Flow 1..2). The setting influences the number of saving intervals.

Selection: **Cnt. 1,** Cnt. + Flow 1, Cnt. 1..2, Cnt. + Flow 1..2

14.19.3 Data log period

Time interval during which the values defined under the data log mode are saved.

Selection: 15 min, 30 min, 1 hour, **1 day,** 1 week, 1 month

14.19.4 Data log integration period

Integration period for determining the min. and max. values. If the setting is “0”, no average value is generated; the min/max of each value is tested.

Range: 0 ... **15** … 255 min

14.20 Communication

Additional and extensive information about M-Bus and Modbus is available separately.

14.20.1 M-Bus address

Primary address for reading via the M-Bus protocol.

Range: 0 ... **1** … 250

14.20.2 M-Bus baud rate

Baud rate for the M-Bus interface. The baud rate can be altered without a password.

Selection: 300, 600, 1200, **2400**, 4800, 9600

14.20.3 M-Bus secondary address

Secondary address for reading via the M-Bus protocol.

Range: 00000000 ... 99999999 (see M-Bus description)

14.20.4 M-Bus manufacturer

Manufacturer code on the M-Bus .
METRA = MET = 8372_D,
Bopp & Reuther = BUR = 2738_D

Selection: Unknown, **METRA**, B&R

14.20.5 Address RS232 (Modbus)

Primary address for reading via the Modbus protocol.

Range: 0 ... **1** … 250

14.20.6 Mode RS232

Selection of the protocol. Set to M-Bus the parameters for RS232 are ignored. The M-Bus parameters are used.

Selection: AUS, **ASCII**, RTU, M-Bus

14.20.7 RS232 baud rate

Baud rate for the RS232 interface. The baud rate can be altered without a password.

Selection: 2400, 4800, 9600, **19200**

14.20.8 RS232 data bit

Number of data bits.

Selection: 7 bits, **8 bits**

14.20.9 RS232 parity

Type of parity.

Selection: **NO**, EVEN, ODD

14.20.10 Counter factor

Counter factor for the transfer of counter readings via M-Bus or Modbus. The counter readings are transferred in LONG format (2^32). The smallest counter step is equivalent to the counter factor. The basic units for internal calculation are l, kg, Wh. A decade overflow of the displayed counters occurs for each 10^{12} of the basic unit. A decade overflow of the transferred counters occurs for each 10^{9} of the counter factor.

Selection:

0.0001 [m3-t-kWh]*10	0.1 [l-kg-Wh]*10	100 [ml-mg-mWh]*10
0.001 [m3-t-kWh]	1 [l-kg-Wh]	1000 [ml-mg-mWh]
0.01 [l-kg-Wh]*100	10 [ml-mg-mWh]*100	

14.21 Calibration

14.21.1 PT100 calibration offset / gradient 1 ... 2

Calibration values for the PT100 input.

Range: According to parameter

14.21.2 PT500/1000 calibration offset / gradient 1 ... 2

Calibration values for the PT500/1000 input.

Range: According to parameter

14.21.3 Current input calibration offset / gradient 1 ... 2 (6)

Calibration values for the current input.

Range: According to parameter

14.21.4 Current output calibration offset / gradient 1 ... 2 (6)

Calibration values for the current output.

Range: According to parameter

14.22 Counters

14.22.1 Clear counters

All the counters are reset to 0.

14.22.2 Set value counter

Changing and saving the new value.
(When selecting the parameter, the current counter status is displayed and frozen. Use “Next” to accept the possibly changed value in the counter.)

Range: Counter range

14.23 Password

14.23.1 Password L1 - L4

Range: 1 - 9999, 0 = password deleted

	KL0	KL1	KL2	KL3	KL4
Default password	without	0009	0099	0999	9999

5 password levels are supported for accessing the set values via keys or the communication interfaces. If a set value is to be altered, the respective password level must be released first. This occurs by entering or sending a valid password. Higher password levels include all the lower ones. A password level can be deactivated via a respective command and once a defined period has expired (3 min). The password can also be deleted, i.e. to ensure there is no further access via this password level. If all the passwords have been deleted, it is no longer possible to access the set values. This can also be used as a calibration seal by deleting the passwords of the L3 and L4 level. New passwords can then only be entered if the calibration bridge has been inserted.
To delete or alter a password, the respective password level must be released first via the current valid password.
Password level L0, no password:
Only the communication parameters for M-Bus and Modbus can be altered here.
Password level L1:
Access for end customers. Configuration of the current output, etc.
Password level L2:
Access for the operator.
Password level L3:
Access for the test centre.
The electronics has a defined interface at this level. The set values only depend on the connected sensors and applications.
Password level L4:
Access for the electronics manufacturer. All the line-up values of the electronics are saved here.
Default passwords:
Default passwords are loaded for the various password levels during the factory test. The person responsible for each respective level must ensure that these passwords are replaced by secret passwords or the passwords are deleted in order to prevent unauthorized access. The password L4 is deleted at the end of the factory test.

Name	CL
Passwords	0
Application	
Basic application	3
Language	1
Additional counters	3
Type label	1
Display	
Counters	3
Actual values	2

Name	CL
Primary sensor	3
Orifice	3
Linearization	3
Secondary sensor	3
Inputs	3
Medium	3
Differential pressure	3
Pressure	3
Air pressure	2

Name	CL
Temperature	3
Thresholds	1
Outputs	1
Clock	1
Tariff	2
Communication	0
M-Bus	0
Modbus	0
Counter factor bus	2
Counters	3
Service	4

Values printed in **bold** type include whole groups of set data.

15 Information Menu

15.1 Time recording

A real time clock has been integrated. However, since this can be altered, the hourly values are determined by an internal pulse.

15.1.1 Time

Display and setting of the time.

Range: 00:00:00 ... 23:59:59

15.1.2 Date

Display and setting of the date.

Range: 01.01.00 ... 31.12.99

15.1.3 Operating hours

Display of the total operating hours.

Range: 00000.00 h ... 99999.99 h

15.1.4 Measuring hours

Display of hours in which the flow rate was above the crawl flow rate.

Range: 00000.00 h ... 99999.99 h

15.1.5 Downtime

Display of hours during which there was no power supply to the electronics. Calculation only occurs when the real time clock is working.

Range: 00000.00 h ... 99999.99 h

15.1.6 Saturated steam hours

The hours during which the value falls below the saturated steam line are added together irrespective of the activated saturated steam monitor.

Range: 00000.00 h ... 99999.99 h

15.1.7 Error hours

Number of hours during which an error message was displayed. If the saturated steam monitor has been activated, the saturated steam hours are also counted.

Range: 00000.00 h ... 99999.99 h

15.2 Calculation unit:

Display of information about the hardware and software. Display of the version and check sum.

15.3 Modules

Display of the slot assignment and the module type.

16 Logbook Menu

General information about the data logger functions
The calculation unit has extensive data logger functions.
2 fixed dates, up to 30 monthly values, 100 error messages, 100 parameter changes, min/max values for 12 months and up to 800 data sets can be saved.
All the memories are designed as ring buffers. If the memory is full, the oldest value is overwritten by the new one. All the memories can be either manually read at the device or via the Modbus interface.

In order to optimize the memory, there is an operating mode which defines which data should be saved. The setting applies to all the memories.

Operating Mode	**Function**
Cnt 1	All the counters with index 1 are saved.
Cnt + Flow 1	All the counters and flow values (capacity, volume, mass, standard flow) with index 1 are saved
Cnt 1..2	All the counters with index 1 and 2 are saved.
Cnt + Flow1..2	All the counters and the flow values with index 1 and 2 are saved.

Fixed date
2 fixed dates (month, day, time = midnight) can be specified. At the programmed time (changeover from the proceeding day) all the current counters and the date (end of the proceeding day) are copied into the fixed date memory. They remain available until the fixed date re-occurs; this is usually one year later.
(Example: 1.6. is set – saving then takes place on 31.5. at 23:59)

All 8 counters are saved, irrespective of the operating mode.
(Switching is not advantageous for the memory)

Monthly values
At the end of each month (changeover to the next month) all the current counters and the date (end of the month) are saved.

In operating mode C 1, 30 counter sets are saved; in operating mode C 1..2, 16 counter sets are saved.

Period memory
The counters and the min/max values of the flow data can be saved at a set interval. The interval and the integration time (average value) can be set.

The intervals are ¼ h, ½ h, 1 h, 1 day, 1 week and 1 month.
The integration time can be selected between 0 and 255 minutes. The calculation values are determined via the integration period and compared to the saved min/max values at the end of the integration period. If the determined value is outside the saved values, the new value is accepted as the min/max value. The non-averaged values are processed for the integration period 0.
Average values are not saved, as these can be determined via the counter readings.
((Counter reading of the current period – counter reading of the preceding period) / period duration = average value)

Depending on the setting, between 150 and 800 periods are saved. The end of the period is always saved as the time and date.

Error memory
The error memory displays the last 100 error messages with error number, time and date.

Parameter memory
The parameter memory records the last 100 changes with date, time and the old value.
Min / Max memory

In order to test device functions and application, the min/max of the primary measured values (pressure, temperature, etc.) are monitored and saved. There is no average value, each individual measured value is considered.

The values are saved per day for 31 days and per month for 12 months.

(In particular, this is meant to detect and document overload situations.)

17 Energy and Flow Computer Connection

Power supply:

Supply voltage:	180 V ... 264 V AC, 18 V ... 36 V DC (optional)
Cable gland:	1x M20, 3x M16 and 5x M12
Cable diameter:	3.5 to 12 mm
Terminals:	Spring cage terminals
Wire cross section:	0.5 ... 1.5 mm² rigid and flexible Modules 0.4 ... 0.8 mm² rigid and flexible
Cable type:	We recommend Li2YY (twisted pair, without shielding)
Cable length:	For sensors in accordance with EC Directive 2004/22/EC Annex MI004 up to 100 m. For output signals and other installations up to 500 m (depends on the laying and ambient conditions).

We recommend the use of twisted pair cables. No shielded cable is required. Should there be shielded cable because the transmitter manufacturer recommends it the screen should not be connected on ERW 700.

Example:

Temperature sensors	4-adrig, twisted pair	z.B. LiYY (TP) 4*0,5 mm²
Druckgeber	2-adrig, twisted pair	z.B. LiYY (TP) 2*0,5 mm²
DT31x (up to 45 m)	6-adrig, twisted pair, shielded	z.B. LiYCY 6*0,5 mm²

18 Certificates and Approvals

DIN-EN 9001 certified production.

Type examination in accordance with EC Directive 2004/22/EC Annex MI-004.
Certificate No: **DE-08-MI0004-PTB004**

Type examination in accordance with „Eichordnung EO 22“ as part of Cold-meters and combined Heat-Cold-meters. **PTB Z 22.75** / **09.02**

CE Mark:
The measuring system fulfils the legal requirements of the EC Directives 2004/108/EG and 2006/95/EC including all published revisions or amendments to date. METRA Energie-Messtechnik GmbH confirms successful device testing and affixing of the CE Mark.

19 Appendix

19.1 Error messages

After eliminating the cause of the error, the error messages are automatically deleted. Only pulse errors have to be acknowledged. The last 100 error messages are saved.

Code	Designation	Cause	Effect
E01	Power failure	No power supply, defective fuse	No functions Display is black
E02	AD converter I	AD converter for current measuring defective	Measured value fails or calculation is carried out with preset values Error can only be eliminated by the manufacturer.
E03	AD converter PT	AD converter for temperature measuring defective	Measured value fails or calculation is carried out with preset values Error can only be eliminated by the manufacturer.
E04 E05 E06 E07	AD-I1 AD-I2 AD-I3 AD-I4	Measured data outside the measuring range Wiring error	Measured value fails or calculation is carried out with preset values
E08 E09	AD-PT1 AD-PT2	Measured data outside the measuring range Wiring error	Measured value fails or calculation is carried out with preset values
E10 E11	Temperature 1 Temperature 2	Measured data outside the measuring range Wiring error	Measured value fails or calculation is carried out with preset values
E12 E13	Pressure 1 Pressure 2	Measured data outside the measuring range. Wiring error. Pressure sensor is selected but not connected or the current is less than 3.6mA. No pressure sensor connected or no preset value for gaseous media.	Measured value fails or calculation is carried out with preset values
E14	Density 1	Calculated density 1 is 0 kg/m3.	Preset value is used for calculations.
E15	EEprom	Error when writing in the internal EEPROM	
E16	EEprom Para.	Parameter after device restart outside the permissible range	Default value is used for the affected parameter.
E17	EEprom C.	Incorrect check sum of the counters saved in the EEPROM	
E18	Out.pulse>max	Buffer overflow. Pulse value or minimum pulse width has been set incorrectly.	Output pulses are lost. No influence on the displayed counters.
E19	Mathematics	Incorrect configuration, incorrect parameters	No re-evaluation
E20	Timeout LCD	Communication between the basic device and the display interrupted	No influence on the re-evaluation
E21 E22	Conf. Temp. 1 Conf. Temp. 2	Error in the configuration of the temperature input.	See E10
E23 E24	Conf. Pressure 1 Conf. Pressure 2	Error in the configuration of the pressure input.	See E12
E25	Conf. DP	Error in the configuration of the differential pressure input.	Preset value is used for calculations.
E26	Conf.PriSensor	Error in the configuration of the primary sensor.	Flow rates are set to 0
E27	Conf.SecSensor	Error in the configuration of the secondary sensor.	See E26

E29	Conf.Density 1	Error in the configuration of the density measurement.	See E14
E30	Reference density	Calculated reference density from reference pressure/temperature = 0 kg/m3	Fixed substitute value of 1.293 kg/m3 is used for the calculation
E31	CRC-EEprom	Memory (EEPROM) defective or not installed	
E32	DP	Measured data outside the measuring range Wiring error Differential pressure sensor is selected but not connected or the current is less than 3.6mA.	See E25
E33	Config Density 2	Error in the configuration of the density measurement.	Preset value is used for calculations.
E34	Density 2	Calculated density 2 is 0 kg/m3.	See E14
E35	Primary sensor	Mass/Volume flow is set to 4-20mA for the primary sensor and the current falls below 3.6 mA.	See E26
E36	Secondary sensor	Mass/Volume flow is set to 4-20mA for the secondary sensor and the current falls below 3.6 mA.	See E26
E37	Saturated steam	Measured values are below the saturated steam line.	Saturated steam parameters are used for the further calculation.
E38	DP1	General error for the differential pressure measurement channel 1.	If necessary, switch to second sensor, otherwise no re-evaluation
E39	DP2	General error for the differential pressure measurement channel 2.	See E38
E41	Balancing	Error during balancing (EWZ211.7) Wrong wiring, transmitter defect	dP=0; Q=0
E42	conf. concentration.	Error in setup for concentration measurement	Concentration = 0
E43	Concentration	Error in concentration calculation	Use preset values
E50 E51 E52 E53	Fault Module0 Fault Module1 Fault Module2 Fault Module3	Module defective	If module0 is a current input module3/4, then I3, I4 = 0 mA.
E54 E55 E56 E57	Module0 unknown Module1 unknown Module2 unknown Module3 unknown	Basic device does not recognize the module Software not compatible	
E58	Module0 EEprom	Module memory (EEPROM) defective or not installed	
E59	Slot I3/4	Current module recognized, but wrong slot (<> MODUL0)	Current 3 and 4 are set to 0 mA
E60	M-IIn34 fault	Communication with IIn34 module faulty	See E59
E61	M-IOut34 fault	Communication with IOut34 module faulty	
E62	M-IOut56 fault	Communication with IOut56 module faulty	
E63	M-IOut34 config.	Incorrect configuration of the module	Configuration is carried out according to the device parameters
E64	M-IOut56 config.	See E63	See E63